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## TREES *for* TOWN & CITY STREETS



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**O**NLY vigorous trees that will withstand the adverse conditions of a city should be planted on its streets.

The habit of growth should be suited to the width of the street, and the foliage should be of a pleasing texture.

Trees that bear showy flowers, fruits, or nuts are usually not desirable for street planting. Some trees are also objectionable because their roots penetrate defective sewers; others because they have a tendency to heave sidewalks.

Oaks are probably more generally satisfactory for street planting than any other group of trees, followed closely by elms and sycamores.

Palms do not make good shade trees, though sometimes appropriate for formal effects. The silver and ash-leaved maples and the poplars are not often satisfactory.

This bulletin describes the principal trees that are used for street planting in the United States.

# TREES FOR TOWN AND CITY STREETS

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**SUCCESS** in tree planting on town and city streets depends upon three main factors—proper conditions for growth, timely and intelligent care, and selection of proper varieties. The need of trees on city streets and their care are discussed in another bulletin;<sup>1</sup> in this are indicated the kinds of trees suited to different types of streets and to different regions.

## KINDS OF TREES SUITABLE FOR STREETS

### QUALITIES NECESSARY

A tree must be adapted to the climate and to the soil on which it is to be grown. For use under city conditions it must have healthy foliage that withstands dust and smoke and a root system not easily affected by unusual soil conditions, by restricted feeding areas, or by root pruning when street improvements are made. The top should be in proportion to the width of the street upon which it is used, and it should be rather high headed or easily trained to that form and of open growth.

Of only a little less importance is the character of the foliage masses, whether dark or light, heavy and somber, or open and airy, and also whether they have vivid autumn colorings. Only in the most southern parts of the country and in western California should evergreen trees be considered for street planting, and then only the broad-leaved evergreens, such as magnolias and live oaks. Where there is lack of sunshine in winter, due to short or cloudy days, it is desirable to admit all the light possible by using only deciduous trees.

In all sections trees differ greatly in the time when they put out their leaves in the spring and lose them in the fall.

Table 1 shows some of the differences in the relative advancement of spring foliage and in the coloring and the dropping of fall foliage.

<sup>1</sup> See Farmers' Bulletin 1209, "Planting and Care of Street Trees." The planting of country roads is considered in Farmers' Bulletin 1481, "Planting the Roadside" (which is out of print but may be consulted in libraries), and in Farmers' Bulletin 1482, "Trees for Roadside Planting."

TABLE 1.—Comparison of the relative spring leafage and of the time when the leaves of various kinds of trees change color and drop in the fall, based upon observations made at Washington, D. C.

[The indication of forwardness of spring leafage can be taken only approximately, since individual trees of the same species within 100 feet of each other may vary two weeks or more in the date of beginning growth. The number of years in which autumn observations were made, upon which the percentages shown are based, is indicated by the figure in the small circle at the left of each percentage recorded.]

Variety.	Spring foliage (percentage of full leafage).		Autumn foliage.				
			Percentage of leaves dropped.		Color.	Percentage of leaves colored other than green.	
	Apr. 21.	Apr. 28.	Mid-October.	Last of October.		Mid-October.	Last of October.
Red oak.....	5	20	(2) 1	(9) 5	Red and bronze.....	(2) 5	(1) 30
Pin oak.....	5	10	(2) 1	(9) 2	do.....	(2) 28	(1) 75
American elm.....	15	35	(2) 68	(9) 90	Dead yellow.....	(2) 50	(1) 100
English elm.....	50	60	(1) 2	(2) 10	Yellow.....	(1) 5	
White ash.....	8	40	(1) 50	(9) 72	do.....	(1) 90	
Basswood.....	10	20	(2) 70	(9) 86	Brown edge.....	(2) 45	
Linden.....	60	80		(2) 53	Yellow.....	(1) 0	(1) 50
Sycamore.....	15	20		(9) 18	Brown.....	(2) 30	(1) 40
London plane.....			(2) 15	(9) 13	do.....	(1) 0	
Ginkgo.....	40	60	(2) 2	(9) 7	Yellow.....	(2) 5	(1) 90
Sweet gum.....			(1) 3	(1) 35	Red.....	(1) 5	
Tulip tree.....	50	55	(2) 65	(9) 85	Yellow.....	(1) 100	(1) 100
Horse-chestnut.....	75	85	(1) 20	(2) 40	Brown edge.....	(1) 50	(1) 75
Red maple.....	10	40	(2) 8	(2) 45	Red.....	(2) 20	(1) 90
Norway maple.....	60	85	(2) 8	(9) 14	Yellow.....	(2) 0	(1) 10
Sugar maple.....	40	75	(2) 43	(9) 64	Yellow and red.....	(2) 88	(1) 100
Black maple.....	40	70	(1) 5	(2) 60	do.....	(1) 50	(1) 100
Silver maple.....	50	60	(2) 13	(9) 44	Yellow.....	(2) 21	(1) 90
Box elder.....			(1) 80	(1) 100	do.....	(1) 0	
Honey locust.....	5	15	(2) 23	(2) 85	do.....	(2) 0	
Black locust.....	5	15	(1) 15	(1) 31	Yellow.....	(1) 8	(1) 10
Carolina poplar.....	30	75	(1) 60	(9) 77	do.....	(1) 0	
Lombardy poplar.....		75		(2) 53	do.....	(1) 10	
Sycamore maple.....	40	70		(1) 10	do.....		
Kentucky coffee tree.....				(1) 80	do.....		
Koelreuteria.....			(1) 50	(1) 100	do.....	(1) 0	
Swamp white oak.....			(1) 10	(1) 80	do.....	(1) 3	
White oak.....			(1) 10	(1) 10	do.....	(1) 0	
English oak.....			(1) 30	(1) 40	do.....	(1) 0	

Narrow streets should be planted with tall slender trees (fig. 1) or sometimes with small trees. Broad streets may be planted with spreading trees (figs. 2, 7, 9, and 19), or, if provided with a central parking space, with moderate-sized trees in the center and on the sides, or with trees on the sides suited to the space and formal trees in the center (fig. 3).

As a rule, trees native to the locality that have been successfully grown in other cities should be given the preference. When a choice must be made between untried native trees and those tested in a city or town under different soil or climatic conditions, it is better to give the native trees the first trial. Many promising native trees have not been planted on a sufficiently large scale or under sufficiently varied conditions to demonstrate their real value for street planting over any considerable area. Many of the trees mentioned in this bulletin may prove valuable far beyond the areas for which they are suggested. The bur oak, the swamp white oak, the scarlet oak, the chestnut oak, the white oak, the sour gum, and others may be found on further trial to be as valuable as those already demonstrated to be valuable over large areas. Those mentioned have all been tested in a small way.

In many parts of the country trees with conspicuous flowers and those with edible fruits or nuts, and even horse-chestnuts, although the nuts are not edible, are badly mutilated by the public. Every effort should be made to create a sentiment that will protect these attractive additions to street adornment, but where the sentiment does not exist it is better to avoid the planting of such trees except in a limited way.

Some cities have ordinances against the planting of certain trees because their roots sometimes obstruct sewers. Among these trees are the Eucalyptus and some of the poplars. The silver maple is also bad in this respect. The roots of any tree are liable to find their way into a defective sewer, but the trees mentioned are especially noticeable because of their vigorous root growth. It may be questioned whether a tree should be condemned for this growth, as it may be better to have a defective sewer thus revealed than to continue a menace to public health.



FIG. 1.—Narrow upright trees (Lombardy poplars) on a narrow street. Washington, D. C.; midsummer

The poplars and the silver maple are also objectionable because their shallow roots often interfere with pavements, especially poorly constructed ones. Besides the native trees many introduced trees have proved valuable.

#### TREES FOR DIFFERENT REGIONS

To simplify the consideration of the kinds of street trees likely to prove satisfactory, the United States has been arbitrarily divided into the regions shown in Figure 4, an endeavor being made to have each division represent an area with similar growing conditions. A discussion of the strong and weak points of the different kinds will be found with the descriptions of the kinds further on in this bulletin.

**Region 1** comprises the mild humid portion of the northern Pacific coast east of the Cascade Mountains, including the western third of Washington and Oregon and a portion of northern California. The trees native to western Europe are adapted to this region, as the climatic conditions are quite comparable. Most of our American trees also succeed here.

Desirable varieties for street planting in region 1 are the Oregon, Norway, sycamore, and sugar maples; California walnut; tulip; European linden; basswood; sycamore; London plane; white and European ashes; English and American elms; English, red, and pin oaks; ginkgo; and the black locust.

Region 2 is that portion of California lying between the Sacramento and San Joaquin Valleys and the Pacific Ocean. Many varieties of trees will succeed here if given water. Because of the lack of water, unless specially irrigated, the more drought-resistant species should be used.

Deciduous trees useful for this region are the London plane; the California and common sycamore; English, Huntingdon, and American elms; Oregon, Norway, sycamore, and English maples; white, green, and European ashes; red, English, and pin oaks; European linden; basswood; California walnut; honey and black locusts; horse-chestnut; Albizzia; and the Japanese varnish tree, or *Sterculia*.

Evergreen trees which will succeed in region 2 are the Eucalyptus in variety, acacias, rubber, magnolia, California live oak, Victorian and poplar-leaved bottle trees, and in the southern portions the California pepper, silk oak, and jaca-



FIG. 2.—Live oaks, the handsomest southern street tree for broad streets. Biloxi, Miss.; late summer

randa. Palms are much planted, but they do not make good street trees except where a formal effect instead of shade is desired.

Region 3 comprises the Sacramento and San Joaquin Valleys.

The deciduous trees for this region are the California walnut; London plane; California and common sycamores; Oregon, Norway, and sycamore maples; white, European, and green ashes; red, English, valley, and pin oaks; European linden; basswood; English and Huntingdon elms; honey locust; and horse-chestnut. Chinaberries and Texas umbrellas are much planted in these valleys, but are not good street trees. Olives and palms are suitable only for formal effects. Eucalypti are satisfactory but are liable to make trouble with defective sewers. Acacias grow especially well except in the extreme northern part of this region.

Region 4 includes the country from the Sacramento and San Joaquin Valleys to the crest of the Sierra Nevada Mountains. It varies in elevation and correspondingly in temperature and the amount of available moisture.

Where the moisture is sufficient the deciduous trees recommended for region 3, except the valley oak and possibly the California sycamore, may be used. Where there is less moisture, the thornless honey locust, black locust, green ash,

hackberry, poplars, ash-leaved maple, and the American elm if it can be watered the first few years may be planted. In the warmer sections the chinaberry and Texas umbrella may be used.

Region 5 comprises the hot semiarid country of southern California and southwestern Arizona, which is dependent on irrigation.

The best deciduous trees for this region are those suggested for the drier portions of region 4. With ample irrigation the deciduous trees recommended for region 3 might grow.

Among the evergreens the Texas palmetto, Parkinsonia, and the Washingtonia and some other palms can be used where other trees do not succeed. The red and desert gums may be used also in the drier regions. With ample irrigation the evergreens suggested for region 2 should succeed.

Region 6 is the intermountain section, extending from the crest of the Cascade and Sierra Nevada Mountains eastward to the eastern base of the Rocky Mountains. The region includes great variations in growing conditions, often in very short distances. As a whole it is semiarid, and in most places trees can hardly be expected to thrive without irrigation, although in some of the mountain valleys and on some of the mountain slopes almost ideal conditions for tree growth exist.

In the drier parts of the region only those deciduous trees that are weeds under more congenial conditions can be grown. Those that can be planted with the greatest hope of success are the thornless honey locust, black locust, green ash, hackberry, and where the others do not succeed, the poplars and ash-leaved maple. If it can be watered for a few years the American elm usually can be grown, and in the southern half of the region the Mississippi hackberry will probably succeed. Near the southern border, on lower elevations, the chinaberry and Texas umbrella can also be planted. In the locations most favored naturally or where irrigation is possible, the trees suggested for region 9 can be used.

Evergreens that may be used for the drier portions of the southern part of region 6 are the Parkinsonia and the Texas palmetto.

Native trees should be sought and tried.

Region 7 is the northern and central parts of the Great Plains area from the foot of the Rocky Mountains at about the 5,000-foot contour line east to the ninety-eighth meridian. It is rather uniform in general conditions, the character of soil having no wide divergence and the elevation increasing gradually from south to north and from east to west. The rainfall gradually increases from west to east until at about the ninety-eighth meridian the conditions are more favorable for tree growth.

The trees to be relied on are the thornless honey locust, common hackberry, black locust, green ash, ash-leaved maple, the poplars, and the Chinese elm. The American elm and the silver maple will frequently prove satisfactory if they can be watered the first few years after transplanting. The mossy-cup oak is another tree worth testing in a small way, as it is native a little east of the ninety-eighth meridian. The basswood and Norway maple would probably succeed if supplied with plenty of water.

Region 8 is the southern part of the Great Plains.

In addition to the deciduous trees recommended for the northern Great Plains (region 7), the Mississippi hackberry, Texas umbrella, and chinaberry may be successfully grown.



FIG. 3.—Formal trees in a central parking, but appropriate trees wanting on the sides of the street. Canary Island date palms in Merced, Calif.; midsummer



Evergreen trees that may be used in region 8 are the Texas palmetto and Parkinsonia.

Region 9 is the upper Mississippi Valley, including the area eastward from that already considered to Lake Michigan and south to southern Kansas. It is more favorable to tree growth than regions 6 and 7.

Trees which will succeed here are the American elm; red, pin, mossy-cup, and other native oaks; white ash; sycamore; basswood; and Norway and sugar maples.

Region 10 includes the northeastern part of the country from eastern Illinois to the Atlantic Ocean, and extends southward through the Appalachian Mountains. It is most favorable for tree growth.

The best trees for street planting in region 10 are the red and pin oaks, London plane, sycamore, the staminate form of the ginkgo, basswood, tulip, Norway maple, white ash, thornless honey locust, American elm, and in the southern portion of the region on light land the sweet gum. The red and sugar maples are among the best trees for suburban conditions. The hackberry will grow,

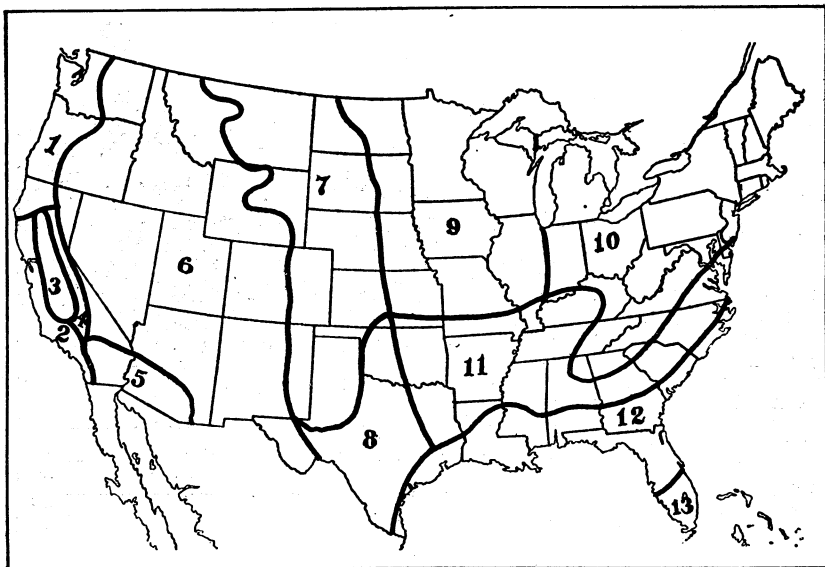


FIG. 4.—Outline map of the United States, showing the regions within which essentially similar conditions for tree growth exist

but should be discarded in favor of better varieties. The mossy-cup and chestnut oaks are worthy of trial on gravelly soils in the suburbs.

Region 11 includes the lower Mississippi Valley and the country east of the southern Appalachian Mountains, extending from the light lands near the South Atlantic and Gulf coasts to the northern limits of the distinctively southern flora.

The typical street trees of this region are the willow oak (fig. 5) and water oak, the former a valuable street tree, the latter good when young but comparatively short lived, with no advantages over the willow oak. Other good trees are the red, Spanish, laurel, Darlington, and pin oaks, tulip, sweet gum, American elm, red and Norway maples, and the ginkgo.

Region 12 is the land near the coast from Wilmington, N. C., to the Mexican border, exclusive of the southern part of Florida.

Good deciduous trees for this region are the willow, laurel, Darlington, and Spanish oaks, tulip, sweet gum, sycamore, London plane, American elm, and the staminate form of the ginkgo. The honey locust, red or scarlet maple, Norway maple, and the hackberries are not so good.

The live oak is the characteristic tree of region 12 (fig. 2) and is the pride of the cities that have used it. Even though an evergreen, it is an excellent street

tree, as it is large, spreading, and open. The palmetto and palms thrive and may be used for formal effects. The evergreen magnolia is a good, broad-leaved evergreen. The laurel oak is evergreen in the southern parts of this region.

Region 13 consists of the southern part of Florida. The deciduous trees suitable for this section are the willow, Spanish, and southern red oaks; American elm; Mississippi hackberry; and in the southern half of the region the Poinciana.

Evergreen trees are better suited to region 13 than to any other portion of the United States except possibly southern California. Among the best are the live and laurel oaks, evergreen magnolia, camphor, rubber, silk oak, or grevillea, and casuarina.

### TREES FOR SPECIAL PURPOSES

In the heart of a city, where the greatest difficulty is experienced in getting trees to grow, the ailanthus will probably thrive when nearly all other kinds fail. The sycamore and the London plane are also good. The Carolina poplar will frequently grow in such places and its use may sometimes be warranted.

For very narrow streets the Lombardy poplar is the best tree. (See fig. 1.) For use within the reach of ocean spray or on sandy lands near the coast, the red oak and the red or scarlet maple are suitable as far south as Charleston, S. C., while the sweet gum and the live oak are equally good from Norfolk southward and along the Gulf of Mexico. The red oak, sweet gum, red maple, and eastern live oak are all grown successfully along the Pacific Ocean, while the California live oak can be used from San Francisco southward. The trees that endure the most alkali appear to be the bladder-nut<sup>2</sup> tree, London plane, peppermint gum<sup>3</sup> and its variety *Eucalyptus amygdalina angustifolia*, the Washingtonia and other hardy fan palms, Canary Islands date palm, the camphor tree, *Acacia cyclops*, and *Acacia retinodes*. Only the first two withstand severe freezing weather. The red oak and the red maple are worth testing for alkali conditions.

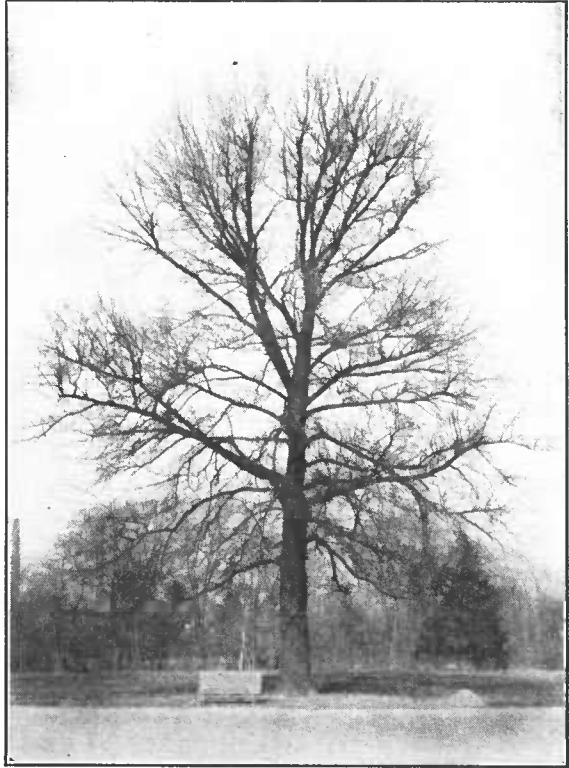


FIG. 5.—Willow oak in winter, Washington, D. C. One of the best street trees for regions 11 and 12

<sup>2</sup> *Koelreuteria paniculata*.

<sup>3</sup> *Eucalyptus amygdalina* Labill.

## DESCRIPTIONS OF STREET TREES

**Acacia.**—The acacias, or wattles, are a large group mostly of small trees with showy yellow flowers. Although much used in California, many of them are too small to make satisfactory shade trees, and because of shallow rooting they are injurious to sidewalks. They also stump-sprout badly. They thrive in regions 2 and 3 and in restricted portions of regions 1 and 5.

The Australian blackwood,<sup>4</sup> blackwood acacia, or wattle, often also called black wattle (fig. 6), is a strong, upright tree, growing



FIG. 6.—Blackwood acacia, often called black wattle, Bakersfield, Calif.

to a height of 75 feet and forming a well-shaped head. It is badly affected by citrus scale, and on this account its planting is sometimes prohibited.

The black wattle<sup>5</sup> is a strong-growing round-headed tree that reaches a height of 40 feet and has dark-green leaves.

The green wattle<sup>6</sup> is a rapid-growing tree that grows to a height of 60 feet and forms a round head with finely cut leaves.

The silver wattle<sup>7</sup> is much like the black wattle except that its leaves and young branches are covered with a whitish down.

**Ailanthus.**<sup>8</sup>—The ailanthus, or tree of heaven, is a tall, broad, handsome tree that is especially val-

uable in the heart of closely built or smoky cities. The staminate and pistillate flowers are borne on separate trees. Only the pistillate trees should be used, as the odor of the blossoms of the staminate ones is very objectionable for about 10 days in late spring. These may be produced by grafting from pistillate trees or by propagating from suckers or root cuttings from such trees if they have not been grafted. The ailanthus may not succeed in regions 5 and 13.

<sup>4</sup> *Acacia melanoxylon* R. Br.

<sup>5</sup> *Acacia decurrens mollis* Lindl.

<sup>6</sup> *Acacia decurrens* Willd.

<sup>7</sup> *Acacia decurrens dealbata* F. Muell.

<sup>8</sup> *Ailanthus altissima* (Mill.) Swingle (*A. glandulosa* Desf.)

**Ash.**—Three kinds of ash trees are useful for street planting.

The white ash<sup>9</sup> (fig. 7) is a large oval-headed tree, reasonably satisfactory on rich lands in regions 1, 2, 3, 4, 9, 10, 11, and 12, but it is better adapted to suburban than to urban conditions.

The green ash<sup>10</sup> is one of the few successful trees in regions 6, 7, and 8 and may succeed in region 5. It grows well throughout the remainder of the United States, but is of less value than other trees there. It is much smaller than the white ash, with a broad round top.

The European ash<sup>11</sup> is a large, handsome, round-headed tree suited to regions 1, 2, 3, and 4.

**Camphor.**<sup>12</sup>—The camphor tree (fig. 8) is a large, handsome, oval-headed evergreen that will succeed in the southern half of region 2, in regions 3, 5, and 13, and in the warmer parts of region 12. It



FIG. 7.—White ash trees on a street in Washington, D. C.

will endure more frost than the orange, and where it is successfully grown it is deservedly popular.

**Chinaberry.**—The chinaberry,<sup>13</sup> sometimes known as the China tree, is a small, round-headed, short-lived tree that will grow in regions 2, 3, 5, 8, 11, 12, and 13 and near the southern edge of region 6. It is too short lived to be considered for planting where other trees will grow.

The umbrella tree,<sup>14</sup> or Texas umbrella, is a small, compact form of the chinaberry with an umbrella-shaped top. It is useful for formal effects, as in the parking on a wide street where taller trees are used on the side. It will grow in regions 2, 3, 5, 8, 11, 12, and 13 and in the southern parts of region 6.

**Elm.**—The elms are large, handsome shade trees suitable for use over a wide range of territory.

<sup>9</sup> *Fraxinus americana* L.

<sup>10</sup> *Fraxinus lanceolata* Borck.

<sup>11</sup> *Fraxinus excelsior* L.

<sup>12</sup> *Cinnamomum camphora* (L.) Nees and Eberm.

<sup>13</sup> *Melia azedarach* L.

<sup>14</sup> *Melia azedarach umbraculiformis* Berckmans and Bailey.

The American elm,<sup>15</sup> sometimes called the white elm and water elm, is one of the handsomest American shade trees. (Fig. 9.) It has been the standard street tree of New England, giving to the roadsides and village streets the characteristic appearance which is so attractive to summer visitors.

The American elm is tall and spreading, and where planted as near together as is customary on streets and country roads the effect of the mature trees is that of an arch formed by the growing together of their spreading tops. It is of rapid growth and long lived.

This elm drops its leaves very early in the fall, but it comes into leaf early in the spring. Because of its manner of branching it is especially liable to splitting by heavy winds. This trouble may be lessened by selecting specimens with a close, compact habit of growth or possibly also by great care in training young trees. Two limbs separating from one another by a very small angle, that is, when they start to grow in nearly the same direction, make a crotch that may split. Where two limbs separate at nearly a right angle or where three or more limbs of about equal size grow from a common point or very nearly so, the crotch is likely to be much

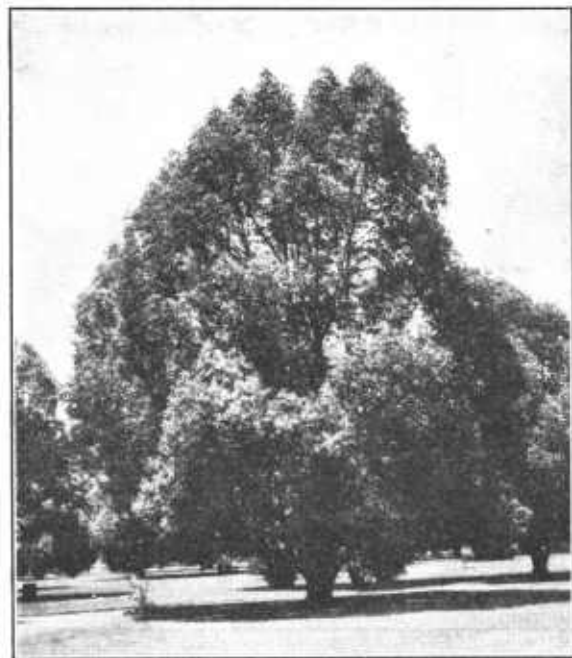


FIG. 8.—A camphor tree

stronger. Careful pruning and training to provide a proper system of branches may be especially helpful with this elm.

Because of the attacks of the elm leaf-beetle<sup>16</sup> and the European elm bark louse,<sup>17</sup> many handsome trees have been severely damaged or killed before communities were properly equipped for fighting them, but with careful spraying these insects may be kept in check. On account of the existence of these pests and because they are gradually spreading to new territory, tree planters should consider carefully whether it is advisable to plant the elm. Where there is no danger from these insects, it is one of the best street trees. Consultation with the nearest State agricultural experiment station or with the Entomologist of the United States Department of Agriculture would be advisable before deciding to plant it.

<sup>15</sup> *Ulmus americana* L.

<sup>16</sup> *Galerucella luteola* Müll. (Data regarding insects furnished by the Bureau of Entomology.)

<sup>17</sup> *Gossyparia spuria* Mod.

The best specimens are to be found in the northern part of region 10, although the elm is being grown all over the United States and is proving a valuable street tree even in towns and villages of regions where the rainfall is as low as 15 inches. It is not recommended for planting in regions 3 and 5.

The English elm<sup>18</sup> is a tall, oval-headed, compact, handsome tree (fig. 10) with leaves smaller than the American elm which stay on much later in the fall. In regions 1 and 2 it is at its best, in the former equaling the American elm and in the latter excelling it. It also thrives in regions 3 and 10 and in the eastern part of region 11.

The Huntingdon elm<sup>19</sup> is a comparatively round-headed European variety. It is a large, handsome tree with good foliage and



FIG. 9.—American elms in winter, Washington, D. C.

is more compact than the American elm. It succeeds well in regions 1, 2, 3, and 4.

The wahoo,<sup>20</sup> or winged elm, is native to the South Atlantic and Gulf States near the ocean. It has larger leaves than the American elm and is not as spreading in its growth, but it succeeds well on city streets in regions 11, 12, and 13.

**Eucalyptus.**—Many species of *Eucalyptus* can be used for street planting in regions 2, 3, and 5. Some cities prohibit their planting because their roots may penetrate defective sewers, and in other cities they must be kept at least 70 feet from a sewer, though even this distance may not prove permanently effective.

A few eucalypti are being planted in southern Florida, but on account of the moist climate they are not likely to succeed except on the drier grounds of the interior, and even there they are not

<sup>18</sup> *Ulmus campestris* L.

<sup>19</sup> *Ulmus hollandica vegeta* (Lindl.) Rehd.

<sup>20</sup> *Ulmus alata* Michx.

equal to the many excellent species that thrive there. They are tall, handsome, quick-growing trees, usually bearing two kinds of leaves at some time in their development.

The blue gum<sup>21</sup> is one of the best eucalypti and the one most commonly used in California. It is tall, globular headed, handsome, and will survive several degrees of frost, but it will not withstand the heat of the deserts in region 5. Its roots are especially likely to invade sewers.

The desert gum<sup>22</sup> is one of the trees most resistant to heat and cold, and it makes a handsome avenue tree. It has pendent branches that have a tendency to severe splitting with age, but with early attention this may be overcome largely. It may prove especially valuable for region 5.



FIG. 10.—An English elm, San Jose, Calif.

The manna gum<sup>23</sup> is another Eucalyptus which withstands several degrees of frost and makes an excellent roadside tree. Some forms shed their bark in long bands that leave the trunks almost white. Many people consider it a dirty tree on this account.

The red gum<sup>24</sup> grows with a broad head, is one of the most resistant of the eucalypti to frost, drought, and heat, and succeeds wherever any of these trees can be grown

in regions 2, 3, or 5, but is most useful in region 5.

The sugar gum<sup>25</sup> is a drought-resistant variety, but it does not withstand cold. It is a common roadside tree in southern California, but becomes straggling with age.

**Ginkgo.**<sup>26</sup>—The ginkgo, or maidenhair tree (fig. 11, *B*), is a native of Japan that thrives in a cool climate or a hot, moist one and succeeds in regions 1, 9, 10, 11, 12, and 13. It is extremely erratic, sometimes growing well, sometimes practically not growing at all, but where it succeeds it is very disease-resistant, and it withstands severe windstorms remarkably well. The leaf is peculiar in appearance, resembling in outline a much enlarged leaflet of maidenhair

<sup>21</sup> *Eucalyptus globulus* Labill.

<sup>22</sup> *Eucalyptus rudis* Endl.

<sup>23</sup> *Eucalyptus viminalis* Labill.

<sup>24</sup> *Eucalyptus longirostris* F. Muell.

<sup>25</sup> *Eucalyptus corynocalyx* F. Muell.

<sup>26</sup> *Ginkgo biloba* L.

fern with a corrugated surface. The tree is conical when young, but as it reaches maturity its top usually fills out, making a broad, almost flat-topped, handsome tree. Only the staminate form should be used, because the pistillate form bears fruits the flesh of which is slippery and dangerous when it drops to the pavement, and to some people it is somewhat poisonous to the touch. Ginkgo trees, therefore, would need to be propagated by budding or grafting from the staminate form.

**Hackberry.**—The hackberry,<sup>27</sup> or sugarberry, is especially valuable in regions 6, 7, 8, and 9, as it grows satisfactorily with comparatively slight rainfall. It is also much used in region 11, but should be superseded there by other varieties. It is of moderate size, with an oblong head of rather open growth and leaves much like those of the elm. It is comparatively short lived.

The name sugarberry comes from the sweet black berries that are borne in the early fall. The tree is sometimes affected by a fungous trouble known as witches'-broom, that causes large numbers of small sprouts to start from the affected portion and gives the infected tree an unsightly appearance. The hackberry should not be planted where this trouble is prevalent.



FIG. 11.—Trees 18 years old on adjacent streets: A, Pin oaks; B, ginkgos; C, Norway maples

<sup>27</sup> *Celtis occidentalis* L.



The Mississippi hackberry,<sup>28</sup> more often called sugarberry than the common hackberry, is a large, open, oblong-headed tree with smoother leaves than the common hackberry. It is useful in the southern part of region 6, in region 8, and to some extent in regions 11 and 12. It thrives well under the same adverse moisture conditions as the common hackberry. The trunk and the large branches have little wartlike projections of the bark scattered irregularly over them. The small twigs are sometimes more or less spotted or winged in the same way. The tree is rather larger than the common hackberry and apparently is less subject to witches'-broom.

**Honey locust.**<sup>29</sup>—The honey locust is a large, open, round-headed, fine-foliaged tree, admitting much light through its top (fig. 12). The common form has stiff spines 2 to 6 inches long, or even longer, but there is also a form without spines, which is the one that should be used for street planting. It is a useful tree in regions 1, 2, 3, 9,

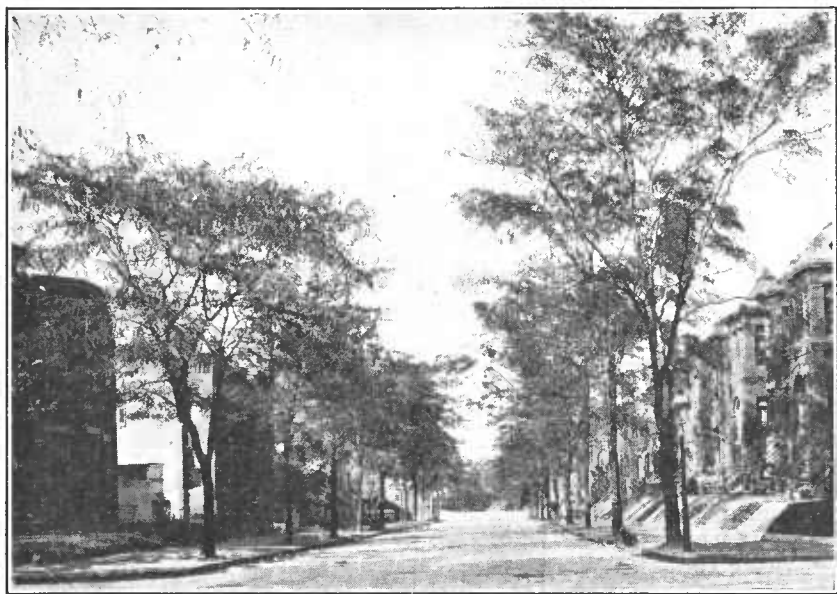


FIG. 12.—A street planted with honey locusts; late summer, Washington, D. C.

10, and 11, but is especially valuable for planting in regions 6, 7, and 8, and may prove useful in region 5.

**Horse-chestnut.**<sup>30</sup>—The horse-chestnut has very showy blossoms, and when in bloom an avenue of these trees commands attention. It is, however, likely to be broken by boys clubbing it for its inedible nuts. It is a medium-sized round-headed tree that does much better under suburban conditions than in a city. It thrives in regions 1, 2, 3, and 10, but in some places its leaves are affected by a mid-summer blight which makes it unsightly during the remainder of the season. It is a close relative of the Ohio buckeye, which is also a handsome though less desirable tree.

**Linden.**—The basswood,<sup>31</sup> or linden (fig. 13), is a large round-headed tree that is excellent for roadsides in suburban locations

<sup>28</sup> *Celtis mississippiensis* Bosc.

<sup>29</sup> *Gleditsia triacanthos* L.

<sup>30</sup> *Aesculus hippocastanum* L.

<sup>31</sup> *Tilia americana* L.

and does well on city streets if the conditions are not too severe. On account of the dark upper surface and the lighter under surface of the leaves and the sweet-scented blossoms in early summer it is much admired. It is not as reliable as some of the other shade trees, as when young it is sometimes attacked at the base of the trunk by a fungous growth that kills the tree. When once established, it forms handsome avenues. It is suited to regions 1, 2, 3, 4, 7, 9, 10, and 11.

The linden,<sup>32</sup> or European linden, has much smaller leaves than the American linden or basswood, with more contrast between their upper and lower surfaces. It is about the same size, but is a little more compact in growth and holds its leaves longer in the fall. It is a useful tree for street planting in regions 1, 2, 3, 4, 9, 10, and 11.



FIG. 13.—Basswoods in winter, Washington, D. C.

**Locust.**<sup>33</sup>—The locust, or black locust, is a desirable street tree in regions 6, 7, and 8, and probably in region 5, as it thrives with comparatively little moisture. It makes a moderate-sized oval head that bears sweet-scented white flowers in late spring or early summer. its greatest drawback is its liability to serious injury and disfigurement by the locust borer,<sup>34</sup> but with proper care this injury can be prevented.<sup>35</sup> In some parts of the East it is also subject to a leaf miner<sup>36</sup> that gives its foliage a burned appearance. In region 3 it holds its seed pods for several years, and thus becomes very unsightly.

<sup>32</sup> *Tilia platyphyllos* Scop.

<sup>33</sup> *Robinia pseudacacia* L.

<sup>34</sup> *Cyllene robiniae* Forst. (Data furnished by the Bureau of Entomology.)

<sup>35</sup> See U. S. Dept. of Agriculture Bulletin 787, entitled "Protection from the Locust Borer." Out of print.

<sup>36</sup> *Chalepus dorsalis* Thunb.

**Magnolia.**<sup>37</sup>—The evergreen magnolia is one of the few good evergreen trees (fig. 14) for street planting, but it is adapted only to regions 1, 2, 3, 11, 12, and 13. There are but few conditions that warrant the planting of a tree having foliage as thick as this because of the dense shade, which is especially undesirable in winter. It grows to be a large oval-headed tree and bears beautiful large white blossoms in late spring or early summer.

**Maple.**—Among the maples are some undesirable trees much used for street planting and some that are valuable only in restricted areas or under special conditions. The maples are not as satisfactory for street planting as usually has been supposed, few of the species being suitable for this purpose and these only in a limited way.

The ash-leaved maple,<sup>38</sup> or box elder, is native to all of the country east of the Rocky Mountains except the regions near the South



FIG. 14.—Magnolia, or evergreen magnolia. A good street tree where an evergreen is permissible

Atlantic and Gulf coasts. It is a small quick-growing tree that will thrive almost anywhere, but it reaches maturity early. There may be conditions requiring the use of this tree in regions 6, 7, and 8, but because of its early decay and of its being subject to destruction by wind it should be grown only when the other trees suggested for these regions will not succeed.

The English maple<sup>39</sup> is small, round headed, with small dark-green leaves, useful in regions 1, 2, 3, and 4.

The Norway maple<sup>40</sup> is round headed and eventually reaches large size, but, as compared with most of the other maples, it is slow growing (fig. 11, C). The persistence of its tendency to form a low head makes it difficult to give it a high head of desirable shape (fig. 15). It is also very thickly branched, and its foliage, being heavy and dark green, permits little light to pass through. On this account it is rather undesirable for street planting. By severe pruning of the interior of the head this defect may be somewhat overcome. The tree is practically free from disease and insects, with the exception of a leaf aphid,<sup>41</sup> which produces yellow spots on the leaves and causes them to drop prematurely; also, the honeydew which they produce is so abundant

<sup>37</sup> *Magnolia grandiflora* L.

<sup>40</sup> *Acer platanoides* L.

<sup>38</sup> *Acer negundo* L.

<sup>39</sup> *Acer campestre* L.

<sup>41</sup> *Periphyllus lyropictus* Kess.

at times as to cover the leaves and wet the sidewalk beneath the tree, the leaves under certain weather conditions becoming blackened with dust accumulating and a fungus growing in the secretion, thereby giving the tree an unsightly appearance. This aphid, however, is not always present and does not seriously injure the tree. The Norway maple comes into leaf later than most of the other maples, but holds its leaves later in the fall. They usually assume a bright yellow hue before they drop. The leaves are preceded by an abundance of yellow-green blossoms. On account of its dense shade and masses of fine fibrous roots it is difficult to grow grass under this tree. Its good shape and attractive dark-green foliage make it popular for street planting in spite of its dense, low head. It will succeed in regions 1, 2, 3, 4, 9, 10, 11, and 12.

The Oregon maple,<sup>42</sup> also known on the Pacific coast as broad-leaved maple, is the large-leaved maple of the northern Pacific slope. It forms a large round head, and with its unusually large dark-green leaves makes a very attractive street tree that succeeds well in regions 1, 2, 3, and 4. It is valuable and worthy of more extended cultivation on the Pacific coast.

The red maple,<sup>43</sup> scarlet maple, or swamp maple is one of the most widely distributed American trees. It is found from Canada to the Gulf of Mexico and west to the Rocky Mountains. Its leaves are the smallest of the eastern native maples, but it grows large and is usually of rather upright outline. It is better adapted to suburban conditions than to city streets and is one of the few trees that succeed well near the ocean. It has bright-red blossoms before the leaves appear. The young leaves and fruits are also red. The mature leaves begin to color early, some branches coloring as early as the middle of July, assuming brilliant reds and yellows and staying on later than those of the sugar maple. It is a handsome tree that is not as much used as it deserves to be in regions 1, 9, 10, 11, 12, and 13.



FIG. 15.—A Norway maple in late winter, showing its poor shape when trimmed to a high head

<sup>42</sup> *Acer macrophyllum* Pursh.

<sup>43</sup> *Acer rubrum* L.

The silver maple,<sup>44</sup> also called the soft maple, white maple, and swamp maple, is probably more used for street planting through the whole United States than any other tree, though it is one of the least desirable. It is usually planted because it is a quick-growing tree, but it is not more rapid in growth than several other trees that are much better. There are three serious objections to its use as a street tree. The first is its brittle wood, which at an early age is easily broken by ordinary windstorms and causes it when a comparatively young tree to become unsightly. The second is its



FIG. 16.—Silver maples severely headed back, an improper way to treat trees, especially silver maples, except under very unusual conditions. Washington, D. C.; midsummer

shallow rooting, which has a tendency to destroy pavements and also makes it difficult to grow grass near the trees. The roots also will grow into sewers. The third is its tendency to decay; the tips of the limbs frequently die, leaving the whole top of the tree bare of leaves, and the wood decays quickly, especially if the bark is broken. For this reason it does not stand pruning as well as most other street trees, and it probably has been pruned more ruthlessly than any other, unless it is the Carolina poplar. It should never be severely deheaded or, as it is popularly called, "dehorned" (fig. 16), as the stubs will practically never heal over, and from these

cuts decay will start, which in a very few years will rot the center of the limbs and trunk and thus destroy the tree. Although it forms a large round head with an open top and its foliage is pale green above and almost white beneath, making a very delightful shade, it should not be used for street planting where other trees can be made to grow. Its use may be warranted, however, in region 7.

The sugar maple,<sup>45</sup> or hard maple (fig. 17), is especially adapted to gravelly soils in regions 1, 10, and 11, the northern parts of regions 2 and 3, and the eastern and southern parts of region 9. It is oval headed, large, and handsome. The leaves come early, but in late summer they begin to turn brilliant yellow and red and drop

<sup>44</sup> *Acer saccharinum* L.

<sup>45</sup> *Acer saccharum* Marsh.

before most other leaves. The sugar maple does not thrive under city conditions, but it is admirably adapted to suburban streets.

Although the sycamore maple<sup>46</sup> is similar in appearance to the Norway maple, it is not a satisfactory street tree in the eastern United States. It succeeds, however, in regions 1, 2, 3, and 4.

**Oak.**—Of the trees used for street planting the oaks are best. They probably have not been more widely planted because of the prevalent belief that they are slow growers and because in the North they are rather difficult to transplant. Although some of the handsomest species, like the white oak and live oak, are slow growers, those suitable for street planting are comparatively rapid growing. The white oak and sugar maple shown in Figure 17 are each 32 years old, and although differing in shape are practically the same size, yet the sugar maple has been considered a sufficiently rapid growing tree to be planted frequently as a street tree, while the white oak has seldom been so used, probably because of an erroneous impression that it is of too slow growth. The oaks are hardy, most of them are long lived, and for the most part they are free from disease and insect attacks. Some of the southern species are subject to attacks of mistletoe.



FIG. 17.—A sugar maple (on the left) and a white oak (on the right), each 32 years old and nearly the same size

The California live oak<sup>47</sup> is an evergreen suitable for use in region 2 and succeeds adjacent to the ocean. It is also useful in

region 3 and in the western part of region 5. It is easily transplanted when young, especially when planted from pots.

The chestnut oak<sup>48</sup> is a native of gravelly soils on eastern mountains and is suitable for similar soils in suburban locations in regions 9, 10, and 11. It is a large, handsome tree.

The Darlington oak (fig. 18) is a form of laurel oak especially desirable for street planting. It is large, round headed; the leaves are a trifle narrower and not quite so nearly evergreen as the laurel oak. It is found wild about Darlington, S. C., where a good form of the laurel oak appears to have been introduced as a shade tree in

<sup>46</sup> *Acer pseudoplatanus* L.  
<sup>47</sup> *Quercus agrifolia* Nee.

<sup>48</sup> *Quercus montana* Willd. (formerly *Q. prinus*).

the early part of the nineteenth century. Its range of usefulness lies in regions 11 and 12.

The laurel oak<sup>49</sup> is a large oval-headed tree that is not as rugged and irregular as the live oak, but is suitable for street planting in regions 11, 12, and 13. It has large, thick, glossy leaves, and in the warmer regions it is almost evergreen. It is readily transplanted, but as it is not so common in the woods as the willow oak and the water oak it has not been so much used as a street tree.

The live oak<sup>50</sup> (fig. 2) is probably the noblest and most majestic of the oaks of regions 12 and 13. It is evergreen and of slow growth, but wherever it is found, whether on streets or in public parks, it is

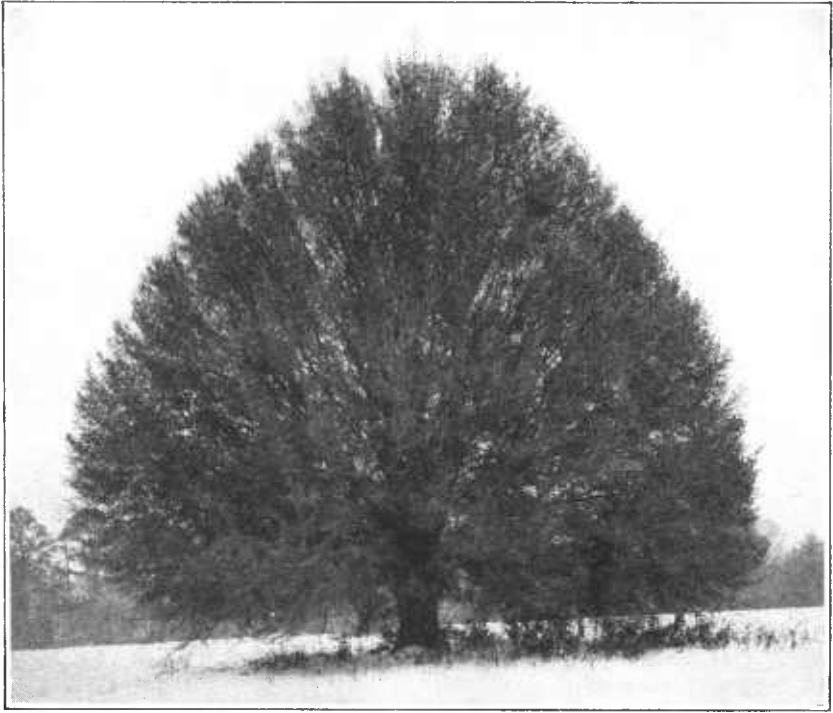


FIG. 18.—A Darlington oak in winter, Darlington, S. C.

the pride of the people. Although an evergreen, it is sufficiently open headed to make a good street tree. When it becomes old it is spreading, and, as a rule, does not form as high a head as the willow oak and the laurel oak. Compared with other southern oaks it is difficult to transplant. It is of sufficient merit to be used on broad streets, and especially on boulevards, where the good of the future as well as the present is considered.

The mossy-cup oak,<sup>51</sup> or bur oak, is native in the northeastern part of the United States and west of the Mississippi River on the hills lying between the river bottoms and the prairies west to the western parts of the Dakotas and Nebraska and central Kansas and Texas. It is a large, handsome tree that should prove satisfactory under

<sup>49</sup> *Quercus laurifolia* Michx.    <sup>50</sup> *Quercus virginiana* Mill.    <sup>51</sup> *Quercus macrocarpa* Michx.

suburban conditions in regions 7, 8, 9, 10, and 11 and on fertile, well-watered soils.

The pin oak <sup>52</sup> (fig. 11, A), sometimes called the swamp oak, is a tall tree, conical when young, oval at maturity, with a drooping habit of the lower branches. The leaves are quite finely divided and of a bright glossy green. The tree comes into leaf late in the spring and holds its foliage late in the fall. On many specimens the dead leaves hang on through the winter, which is often objectionable. It is adapted to narrower streets than the red oak, as its habit of growth is not so spreading. On account of the tendency of the limbs to droop, particularly as they get older, it is desirable that a good strong leader should be developed, so that the lower limbs may be removed from time to time as conditions require. The pin oak thrives on wet and on heavy clay soils, as well as on a wide range of other soils. Figure 11 shows pin oaks, Norway maples, and ginkgos 18 years old on adjacent streets, and illustrates the rapid growth of this oak. At the time



FIG. 19.—A street shaded with red oaks in midsummer, Washington, D. C.

of planting these trees the pin oaks were thought to have the poorest location. This tree is adapted to regions 1, 2, 3, 4, 9, 10, and 11.

The red oak <sup>53</sup> (fig. 19) is probably the best tree for street planting in regions 1, 9, 10, and 11 and is satisfactory in regions 6, 7, 8, and 12. It is a large, oval, open-headed tree of rapid growth. Under good conditions a young red oak will grow 4 feet in a single season. Like the other oaks it is slow in coming into leaf in the spring, but holds its foliage late in the fall. The leaves usually turn a brilliant red before they drop. It is comparatively free from insect and fungous attacks, and it is one of the few trees really suitable for planting close to the ocean, as it thrives on sandy lands only a few feet above high tide or within the reach of ocean spray.

The scarlet oak <sup>54</sup> is a large, open, round-headed tree. Its leaves are more deeply divided than those of the red oak. The leaves turn

<sup>52</sup> *Quercus palustris* L.

<sup>53</sup> *Quercus maxima* (March.) Ashe (formerly *Q. rubra*).

<sup>54</sup> *Quercus coccinea* Muench.



a brilliant scarlet in autumn, being even more gorgeous than those of the red oak. This tree is adapted for street planting and is especially desirable for suburban conditions in regions 1, 9, and 10.

The swamp Spanish oak<sup>55</sup> is adapted to regions 11, 12, and 13. It belongs to the red-oak group, but is larger than the other oaks suggested for street planting. It is well adapted to suburban locations, but apparently it has not been tested under severe city conditions.

The valley oak<sup>56</sup> is a beautiful tree for regions 2 and 3 and the more favorable parts of region 5. When transplanted young, especially if taken from a pot, it is easily established where there is opportunity to water it for a few years.



FIG. 20.—Leaves of some of the southern oaks: A, Live oak; B, willow oak; C, laurel oak; and D, water oak.

The water oak<sup>57</sup> is frequently confused with the willow oak and the laurel oak, as these three oaks are not distinguished from one another except by close observers of trees. It is probably more used than any other tree in the cities of region 12 and the adjoining portions of region 11. It is the weed of the southern oaks and one of the weeds of the street trees of the Southern States. It is comparatively short lived and seems to be more subject to attacks of mistletoe and more easily affected by windstorms than the willow oak, the Darlington oak, and the laurel oak. This tree should not be planted, because it is less desirable than the other oaks mentioned.

<sup>55</sup> *Quercus rubra* L. (formerly *Q. falcata*, and certain forms separated by some botanists as *Q. pagodaefolia* Ashe).

<sup>56</sup> *Quercus lobata* Nee.

<sup>57</sup> *Quercus nigra* L.

The willow oak <sup>58</sup> (see fig. 5), sometimes erroneously called the water oak, is one of the best of the quick-growing oaks for use in regions 11 and 12. It is frequently used with water oak for street planting and is usually confused with it. It is, however, a distinct tree, which can be distinguished readily from the water oak. It is longer lived and is its equal in every other respect. Trees of this variety which apparently have been planted about 80 years are found in excellent condition, while water oaks planted at the same time have either entirely disappeared or are showing marked evidences of decline. Figure 20 shows the characteristic appearance of the leaves of these nearly related species of oaks. In the South the willow oak is readily transplanted, as trees 12 feet high are dug from the woods and planted on the street with success (fig. 21). In the extreme South



FIG. 21.—Willow oaks, transplanted from the woods, as they appeared near the end of the second summer. Montgomery, Ala.

this tree is nearly half evergreen. Its foliage does not assume the bright colors of the trees of the red-oak class.

**Palm.**<sup>59</sup>—Several varieties of palms are used more or less for street planting in regions 2, 3, 5, 12, and 13. Though sometimes effective as a formal street decoration (fig. 22), they can hardly be considered shade trees.

**Palmetto.**—Palmettos, or sabals, abound in region 12 near the coast; succeed in regions 3, 5, and 13; live in region 2; but are seldom grown satisfactorily close to the Pacific coast. They can be used effectively for formal plantings along some streets, park drives, or in liberal central parking spaces in boulevards, but they are not useful as a substitute for shade trees. Their leaves and damaged roots should be cut off in transplanting, and they should be set about 3 feet deep in their new location.

<sup>58</sup> *Quercus phellos* L.

<sup>59</sup> The palms are treated on the basis of notes furnished by Dr. O. F. Cook, of the Bureau of Plant Industry.

The Carolina palmetto<sup>60</sup> is a native of and useful in regions 12 and 13, where it sometimes attains a height of 60 or 80 feet. It will thrive in regions 3 and 5, but is used less there.

The Texas palmetto<sup>61</sup> is especially valuable for southern Texas, where it is indigenous, and it is likely to succeed generally in regions 3, 5, and 12. It grows to a height of 40 feet and in appearance is quite distinct from the Carolina palmetto, the leaf segments being much broader and less drooping.<sup>62</sup>

The Victorian palmetto<sup>63</sup> is another hardy species, probably a native of Mexico, but grown for many years at Victoria, Tex. It is similar to the native Texas species and worthy of general planting in the same region. A feature of this species is that the persistent leaf bases remain alive and green for many years instead of turning yellow or brown, as in the Carolina palmetto.



FIG. 22.—A formal planting on a city street. Palms with interplantings. Redlands, Calif., in midsummer

*Washingtonia palm*.—*Washingtonia* palms are a very conspicuous feature of street and ornamental planting in southern California. Two species are represented, *Washingtonia filifera* Wendland and *W. robusta* Wendland. The first is a native of the canyons and barren slopes that surround the Coachella Valley of southern California, while the other species probably was brought in the early days of travel by way of the Isthmus of Panama from the region of San Jose del Cabo, the extremity of Lower California. The name *robusta* is used because this species grows more rapidly in height than *W. filifera*, though the trunk is more slender. Both species are hardy and thrive well through regions 2, 3, and 5, and also in regions 12 and 13. *Washingtonia robusta* requires less heat than *W. filifera*, but both will endure several degrees of frost. Even in California *Washingtonia robusta* is distinctly preferable for localities near the coast.

<sup>60</sup> *Inodes palmetto* (Walt.) Cook.

<sup>61</sup> *Inodes texana* Cook.

<sup>62</sup> The Texas palmetto. In Jour. Heredity, v. 8, no. 3, p. 123, pl. 1917.

<sup>63</sup> Cook, O. F. A new ornamental palmetto in southern Texas. In U. S. Dept. Agr., Bur. Plant Indus. Cir. 113, p. 11-14. 1913. Proposed name *Inodes exul* Cook. Out of print.

In the vicinity of San Diego the leaves of *Washingtonia filifera* become badly infested with a parasitic fungus that does not attack *Washingtonia robusta*.

*Other hardy fan palms*.—The species most commonly used for street and ornamental planting in the California coast districts is the Chinese or windmill palm.<sup>64</sup> This palm has a slender trunk clothed with brown fibers, flat fan-shaped leaves, and rather straight radiating segments. The same species is hardy at New Orleans and Charleston, and even at Laurens, S. C., at an altitude of 600 feet, but it does not thrive in the sandy soil of Florida.

The vegetable-hair palm,<sup>65</sup> a native of Spain, Sicily, and North Africa, is similar to the Chinese palm but smaller and more compact and with large, sharp spines on the petioles of the leaves. When young it suckers from the base, like the date palm, so that clusters of it may be formed.

The Guadalupe Island palm<sup>66</sup> is one of the most popular species in southern California in the region of Santa Barbara, Los Angeles, and San Diego. This palm is a native of Guadalupe Island, off the coast of Lower California, and is not known to occur elsewhere in the wild state. It is well adapted to the cool coast climate of California, but not to the interior valleys. It is smaller than the *Washingtonia* palms, with a rather short trunk, 15 to 20 feet high, and a dense crown of fresh green leaves.

The California blue palm,<sup>67</sup> formerly placed in the same genus with the Guadalupe Island species, is very distinct in habits as well as in general appearance, having bluish or grayish green leaves, strongly toothed petioles, and long, slender flower clusters. The trunk is very robust, often 2 to 3 feet in diameter, and attains a height of 30 to 40 feet. Several of these features are shared with the *Washingtonia* palms. It also has the ability to grow in the dry, hot interior valleys (regions 3 and 5). In Texas the blue palm has proved hardy at San Antonio, and even as far north as Austin.

*Date palm*.—The Canary Islands date palm<sup>68</sup> is the most popular palm for park or street planting, being more hardy than the true date palm, larger and more vigorous in growth, and producing no suckers from the base of the trunk. Well-grown specimens in the California coast districts (region 2) with trunks from 2 to 3 feet thick and immense crowns of spreading deep-green leaves are among the most imposing forms of plant life. The leaflets instead of radiating from one point, as in fan palms, are arranged along both sides of a common stem or midrib. Palms with this arrangement of leaves are called pinnate palms. Though less robust in other regions, the species is very hardy and adapted for planting anywhere in the palm belt (regions 3, 5, 12, and 13).

The true date palm<sup>69</sup> is adapted to the warmer parts of regions 3 and 5, but it is much inferior to the Canary Island species for ornamental use because the foliage is less attractive, owing to its habit of sending out suckers from the base of the trunk.

<sup>64</sup> *Trachycarpus excelsa* (Thunb.) Wendl.

<sup>65</sup> *Chamaecrops humilis* L.

<sup>66</sup> *Erythea edulis* (H. Wendl.) S. Wats.

<sup>67</sup> *Glaucothea armata* (formerly known as *Erythea armata*). See Cook, O. F., *Glaucothea*, a new genus of palms from Lower California. In Jour. Washington Acad. Sci., v. 5, p. 236-241. 1915.

<sup>68</sup> *Phoenix canariensis* Hort.

<sup>69</sup> *Phoenix dactylifera* L.

*The coconut and its relatives.*—The true coconut palm is confined to a narrow belt along the coast of southern Florida, but other species of *Cocos* are planted in the coast districts of California. The species that is most prominent in park and street plantings around San Diego, Los Angeles, and Santa Barbara is usually known as *Cocos plumosa* or *Cocos romanzoffiana*, and is a rather tall slender palm with a long-jointed trunk about 1 foot in diameter and long, spreading, feathery, deep-green leaves. Another series is represented by *Cocos yatay* and several similar species, often called *Cocos australis* in nursery catalogues. They have short, thick trunks, grayish or bluish foliage, and fleshy edible fruits, highly flavored, somewhat like pineapples. These gray-leaved species are very hardy. Another coconut relative is the Chilean molasses palm,<sup>70</sup> which has a massive trunk 3 or 4 feet in diameter, specimens of which are growing at a few places in California.

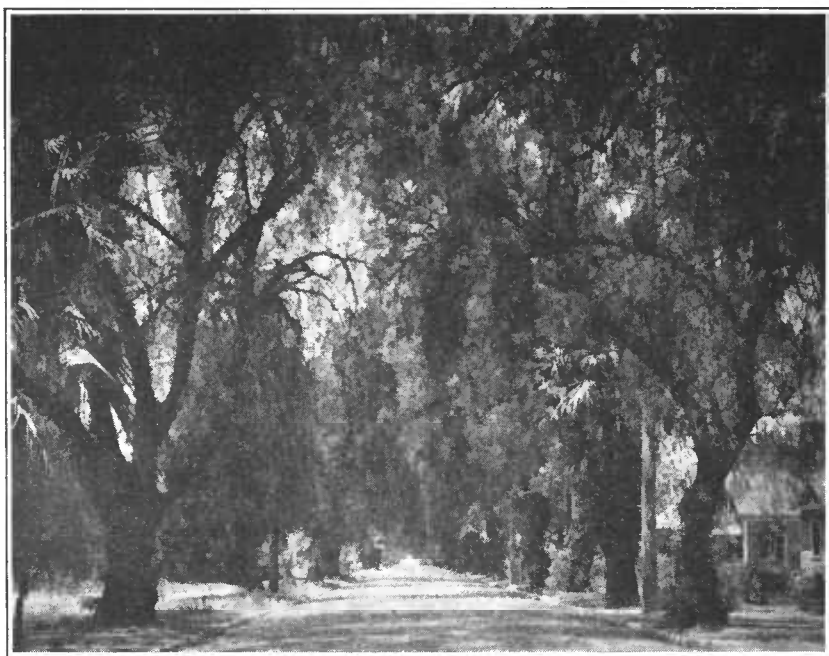


FIG. 23.—California pepper trees, Riverside, Calif.

*Other pinnate palms.*—The amethyst palm, a native of Australia, is commonly planted in California. It usually appears in lists and nursery catalogues as *Seaforthia elegans* or *Archontophoenix alexandrae*, but it is now recognized as distinct from both of these species and has received a new name, *Loroma amethystina*. Except certain species of *Phoenix* and *Cocos*, it is the only pinnate-leaved palm that grows freely in the open air in the coast districts of California, from Santa Barbara to San Diego. In habit and general appearance *Loroma* is more like the royal palm, though with a smaller trunk and fewer leaves. The pinkish purple drooping flower cluster is very attractive and develops into a large cluster of scarlet berries.

<sup>70</sup> *Jubaea chilensis* Baill.

The royal palms, species of *Roystonea*, are perhaps the most striking ornamental members of the whole group. They can be grown in southern Florida and even exist in the wild state in some of the hammocks below Miami.

**Pepper tree.**<sup>71</sup>—The California pepper tree (fig. 23) is much used in regions 2 and 3 and in the western part of region 5. It is a moderate-sized, broad-headed tree with fine foliage, which gives it a light, airy appearance. During the fall and winter it is covered with scarlet berries, which in contrast with the persistent foliage produce a pleasing effect.

**Poplar.**—Poplars are not desirable for street planting. Their wood is easily broken by ordinary windstorms, and their roots run near the surface and are likely to interfere with pavements, as shown in Figure 24, while those of some varieties are especially likely to make trouble in sewers by filling them with a mass of fibrous roots if



FIG. 24.—A pavement heaved by the roots of poplar trees

access is once gained. Vigorous root growth is encouraged by the moisture from a leak, and the roots ultimately find their way inside. The mature seed is carried by a cottonlike appendage, and in many varieties this is so abundant as to be another serious objection to the planting of these trees.

The southern cottonwood,<sup>72</sup> Carolina poplar, and the northern cottonwood<sup>73</sup> are very similar in their adaptability for street-planting purposes. They are easily propagated, easily transplanted, are quick growing, and where they reach maturity under normal conditions form very large oval-headed handsome trees, but under the artificial conditions existing in cities it is necessary to prune them quite severely when young to remove the long vigorous growths and make the heads more compact. This pruning stimulates more vigorous growth, which must be removed or they will form long branches

<sup>71</sup> *Schinus molle* L.

<sup>72</sup> *Populus deltoides* Marsh.

<sup>73</sup> *Populus virginiana* Foug.

with heavy tops that are especially liable to injury by windstorms. The more they are pruned the greater the tendency to an undesirable form of growth. They begin dropping their leaves early in the summer and lose them very early in the autumn. Their root growth is vigorous, especially in the presence of abundant moisture. Except in regions 6, 7, or 8, or in locations where smoke and fumes in the air prevent the growing of other trees, they should not be planted.

The Lombardy poplar<sup>74</sup> is a tall columnar tree adapted for use on very narrow streets. (See fig. 1.) It is short lived in many places,



FIG. 25.—Sweet-gum trees, Washington, D. C.

owing largely to the European poplar canker, but otherwise is a satisfactory tree for these conditions in all parts of the United States. The trees may be planted as close together as 30 feet.

None of the other poplars have much to recommend them for street planting.

**Rubber tree.**<sup>75</sup>—The rubber tree is a large-headed handsome evergreen, suitable for regions 3 and 5 and the southern parts of regions 2 and 13 when the use of an evergreen tree is warranted.

**Silk oak.**<sup>76</sup>—The silk oak, or Australian fern, is a large, handsome tree that succeeds well in regions 2, 3, and 13; also in region 5 if provided with a rea-

sonable amount of moisture, as it stands drought remarkably well. It is covered in early summer with orange-colored flowers.

**Sweet gum.**<sup>77</sup>—The sweet gum (fig. 25) is adapted to regions 11, 12, and 13, especially on sandy lands. It forms an oval-headed, handsome tree with star-shaped leaves that assume a particularly brilliant hue in the autumn. It is better adapted to suburban conditions than to the heart of a city. Toward the northern limits of its successful cultivation it is difficult to transplant, while in the warmer sections of the country it can be moved with comparative ease. It should be transplanted only in the spring.

<sup>74</sup> *Populus italica* (Du Roi) Moench.

<sup>75</sup> *Ficus elastica* Roxb.

<sup>76</sup> *Grevillea robusta* A. Cunn.

<sup>77</sup> *Liquidambar styraciflua* L.

**Sycamore**—The sycamore,<sup>78</sup> also called the buttonwood and buttonball tree, is a large, open, spreading, quick-growing tree native along watercourses. It is adapted to regions 1, 2, 3, 4, 9, 10, 11, 12, and 13 and is worth testing in regions 5, 6, 7, and 8. Its habit of shedding its outer bark in large flakes, leaving the white new bark showing in large patches, makes it a conspicuous tree wherever grown. The fruits are balls 1 inch or more in diameter and are sometimes objected to because they make dirt when falling; also the shed bark is considered objectionable. It is such a strong-growing, handsome tree and succeeds so well under city conditions that it is being planted more and more frequently. It will stand more prun-



FIG. 26.—London plane trees, Washington, D. C.

ing and shaping than any other street tree. Without pruning it is too large for ordinary streets unless spaced at almost double the usual planting distance, with the trees staggered along the street instead of being planted opposite. Its high head and open habit of growth are distinct advantages for street planting. Its foliage, too, is a light green, which gives an impression of airiness with the shade. It is subject to attack by a fungus that kills the leaves while still small or partially mutilates them, giving them an unsightly appearance. In some places this trouble is rather serious.

The California sycamore<sup>79</sup> is a native of California, adapted to regions 1, 2, 3, and 4, and portions of region 5. It is similar in general characteristics to the sycamore.

<sup>78</sup> *Platanus occidentalis* L.

<sup>79</sup> *Platanus racemosa* Nutt.





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The London plane tree<sup>80</sup> is one of the Old World forms of sycamore (fig. 26). According to Alfred Rehder,<sup>81</sup> "the true oriental plane is rare in cultivation, the tree usually planted under this name being *Platanus acerifolia*." It is more compact in habit of growth and has the other good qualities of the sycamore. It is being more and more used on city streets and is proving satisfactory in regions 1, 2, 3, 4, 9, 10, 11, and 12. It will probably succeed in the warmer parts of regions 6 and 7 and also in regions 5 and 8. It is a more desirable tree for ordinary use than the sycamore, on account of its more compact habit and comparative freedom from disease, though it is tender in the northernmost sections.

**Tulip tree.**<sup>82</sup>—The tulip tree is also sometimes called the tulip poplar (fig. 27) or yellow poplar, though the latter names are un-



FIG. 27.—Tulip trees, sometimes called tulip poplar and yellow poplar, Washington, D. C.

fortunate, as the tree is not a poplar or even closely related to the poplars. It is a large, rapid-growing tree suitable for suburban conditions in regions 1, 2, 10, 11, and 12. The leaves are of unusual form, the upper half appearing to have been cut away, leaving a notch about where it would seem the middle of the leaf should be. The color is a light green. The roots are unusually soft and tender, and therefore the tree needs to be transplanted quickly and with great care. Small sizes should be planted, especially near the northern limits of growth. It should be transplanted only in the spring. If after transplanting it the top should die and a new vigorous shoot should put out from the root, it would be desirable to form a new top from this shoot rather than to transplant another tree.

<sup>80</sup> *Platanus acerifolia* (Ait.) Willd.

<sup>81</sup> Bailey, L. H., ed. New York, 1916. Standard Cyclopedia of Horticulture, v. 5, p. 2707.

<sup>82</sup> *Liriodendron tulipifera* L.